Alg. 2 Warm Up # 5-2 **Solve:**

1. $\log_x 16 = 2$

2. $\log_2 x = 5$

3. $5^{3x} = \left(\frac{1}{25}\right)^{x+5}$

4. $9x^2 - 25 \leq 0$

HW Questions:

Review & Preview

6-51. Use the algebraic strategies you developed in today's lesson to solve the system of equations at right. Be sure to check your solution.

① $2x + y - 3z = -12$
② $5x - y + z = 11$
③ $x + 3y - 2z = -13$

Eliminate y

3②: $15x - 3y + 3z = 33$
$16x + z = 20$

① + ②: $7x - 2z = -1$
3② + ③: $(16x + z = 20)2$

$32x + 2z = 40$
$7x - 2z = -1$

$39x = 39$
$x = 1$

$\boxed{(1, -2, 4)}$

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Eliminate y

① + ② → $7x - 2z = -1$
③ + ②(3) → $16x + z = 20$

$3(5x - y + z) = 11(3)$
$15x - 3y + 3z = 33$
$x + 3y - 2z = -13$
$16x + z = 20$

Now solve for x & z, plug them into one of the original equations to find y

answer is a point

$\boxed{(x, y, z)}$

6-52. Suppose that a two-bedroom house in Nashville is worth \$110,000 and appreciates at a rate of 2.5% each year.

$= 110{,}000(1.025)^t$

a. How much will it be worth in 10 years?

b. When will it be worth \$200,000?

c. In Homewood, houses are depreciating at a rate of 5% each year. If a house is worth \$182,500 now, how much will it be worth two years from now?

6-53. Solve $(\sqrt{5x-1})^2 = (\sqrt{6+4x})^2$ and check your solution.

$5x - 1 = 6 + 4x$
$x = 7$

$\sqrt{5(7)-1} \stackrel{?}{=} \sqrt{6+4(7)}$
$\sqrt{34} = \sqrt{34}$

6-54. If two quantities are equal, are their logarithms also equal? Consider the questions below.

a. Is it true that 4^2 is equal to 2^4? Is this a special case, or is a^b equal to b^a for any values of a and b?

b. Is $\log 4^2$ equal to $\log 2^4$? How can you be sure?

c. Are the equations $x = 5$ and $\log x = \log 5$ equivalent? Justify your answer.

d. Is the equation $\log 7 = \log x^2$ equivalent to the equation $7 = x^2$? How can you be sure?

$3^2 \neq 2^3$
$5^2 \neq 2^5$

$\log 4^2 \stackrel{?}{=} \log 2^4$
$4^2 = 2^4$

6-55. Use the ideas from problem 6-54 to help you solve the following equations.

a. $\log 10 = \log(2x - 3)$

$10 = 2x - 3$

b. $\log 25 = \log(4x^2 - 5x - 50)$

6-56. Find an equation for each of the lines described below.

y-intercept

$y = \frac{1}{3}x + 5$

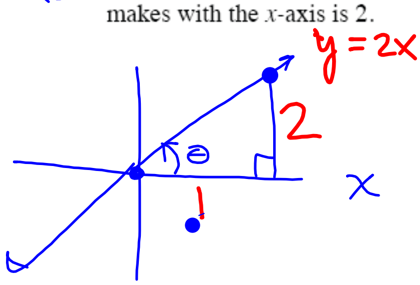
a. The line with slope $\frac{1}{3}$ that goes through the point (0, 5).

b. The line parallel to $y = 2x - 5$ that goes through the point (1, 7).

c. The line perpendicular to $y = 2x - 5$ that goes through the point (1, 7).

Not the y-int, so use pt-slope form

d. The line that goes through the point (0, 0) so that the tangent of the angle it makes with the x-axis is 2.



$\tan\theta = \frac{2}{1}$ $\frac{\text{opp.}}{\text{adj}}$

$\boxed{y - y_1 = m(x - x_1)}$

6-57. Solve each equation below for y so that it can be entered into the graphing calculator.

a. $x^2 = x(2x - 4) + y$

b. $x = 3 + (y - 5)^2$

6-58. Sketch the graph of each equation or inequality below.

a. $(x - 2)^2 + (y + 3)^2 = 9$

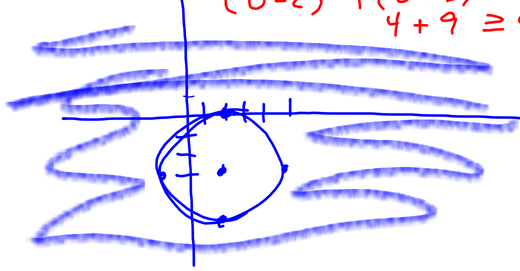
b. $(x - 2)^2 + (y + 3)^2 \geq 9$

center $(2, -3)$ $r = 3$

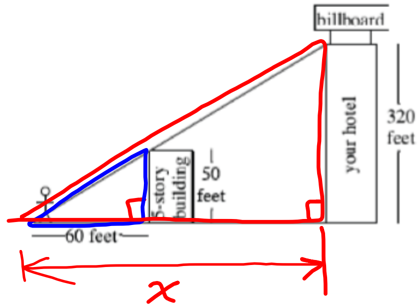
test $(0, 0)$

$(0 - 2)^2 + (0 + 3)^2 \overset{?}{\geq} 9$

$4 + 9 \geq 9$ ✓



6-59. You are standing 60 feet away from a five-story building in Los Angeles, looking up at its rooftop. In the distance you can see the billboard on top of your hotel, but the building is completely obscured by the one in front of you. If your hotel is 32 stories tall and the average story is 10 feet high, how far away from your hotel are you?



$$\frac{x}{320} = \frac{60}{50}$$

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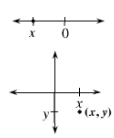
MATH NOTES

Locating Points in Three Dimensions

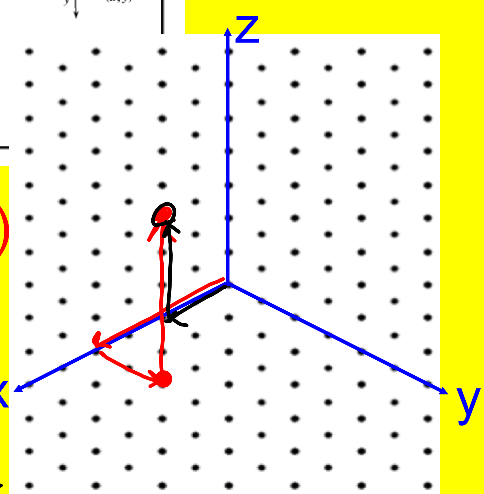
When locating a point on a *number line*, a single number, x, is used.

The location of a point in a *plane* is given by two numbers, (x, y), called an ordered pair.



To locate a point in *space*, three numbers, (x, y, z), are used, which are called an **ordered triple**. The point $(2, 3, 1)$ is shown at right. The dotted lines help clarify which coordinate was graphed.

Example: (4, 2, 5)



(2, 0, 3)

lands in the same place, so you need the arrows!

Yesterday's CP's:

6-48. Practice using your algebraic strategies by solving the systems below, if possible. If there is no solution or if the solution is different than you expected, use the graphing tool to help you figure out why.

a.
① $x + y + 3z = 3$
② $2x + y + 6z = 2$
③ $2x - y + 3z = -7$

b.
$20x + 12y + 15z = 60$
$20x + 12y + 15z = 120$
$10x + 20z = 30$

c.
$5x - 4y - 6z = -19$
$-2x + 2y + z = 5$
$3x - 6y - 5z = -16$

d.
① $6x + 4y + z = 12 \rightarrow 6x + 4y = 12$
② $6x + 4y + 2z = 12 \rightarrow 6x + 4y = 12$
③ $6x + 4y + 3z = 12 \quad 6x + 4y = 12$

Eliminate y

① + ③ $\rightarrow 3x + 6z = -4$
② + ③ $\rightarrow 4x + 9z = -5$

Now solve system for x & z, plug in to find y.

① − ② $\quad -z = 0$
$z = 0$

③ − ② $\rightarrow z = 0$

CP's: 6- # 60, 61, 64, 65

6.1.5 How can I apply systems of equations?

Using Systems of Three Equations for Curve Fitting

In this lesson you will work with your team to find the equation of a quadratic function that passes through three specific points. You will be challenged to extend what you know about writing and solving a system of equations in two variables to solving a system of equations in three variables.

together:

6-60. In your work with parabolas, you have developed two forms for the general equation of a quadratic function: $y = ax^2 + bx + c$ and $y = a(x-h)^2 + k$. What information does each equation give you about the graph of a parabola? Be as detailed in your explanation as possible. When is each form most useful?

$y = a(x-d)(x-e) \rightarrow$ "a" gives us stretch or compression and whether it is reflected in the x-axis.

x-int: $(d, 0)$
$(e, 0)$

$y = a(x-h)^2 + k \rightarrow$ "a" is same as above
vertex (h, k)

$y = ax^2 + bx + c \rightarrow$ "a" is same as above
y-int: $(0, c)$

6-61. Suppose the graph of a quadratic function passes through the points (1, 0), (2, 5), and (3, 12). Sketch its graph. Then work with your team to develop an algebraic method to find the equation $y = ax^2 + bx + c$ of this specific quadratic function.

Discussion Points

What does the graph of any quadratic function look like? parabola

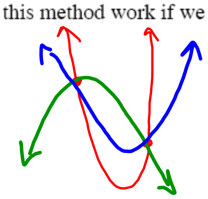
What does it mean for the graph of $y = ax^2 + bx + c$ to pass through the point (3, 12)? when $x = 3$, $y = 12$. It is a solution to the equation.

What solving method can we use to find a, b, and c? Solve a system

How can we check our equation? Plug points on the parabola into the equation to make sure they work.

Would this method allow us to find the equation of a quadratic using *any* three points? yes

Would this method work if we only had two points? No.



Many parabolas can pass through 2 given points. You need 3 pts to determine a unique parabola.

6-64. Find the equation $y = ax^2 + bx + c$ of the function that passes through the three points given in parts (a) and (b) below. Be sure to check your answers.

a. (3, 10), (5, 36), and (−2, 15) b. (2, 2), (−4, 5), and (6, 0)

$$\underline{y} = a\underline{x}^2 + b\underline{x} + c$$

x y

$(3, 10) \rightarrow 10 = a(3)^2 + b(3) + c \rightarrow 9a + 3b + c = 10$

$(5, 36) \rightarrow 36 = a(5)^2 + b(5) + c \rightarrow 25a + 5b + c = 36$

$(-2, 15) \rightarrow$

6-65. What happened in part (b) of problem 6-64? Why did this occur? (If you are not sure, plot the points on graph paper.)

HW: 6- #71- 79

Quiz Thursday:

1. Log Graph
2. Change forms: log. $\longleftrightarrow$ exp.
3. Simplify rational expressions